

We claim:

5 1. A multi-layer, thermoplastic stretch wrap film containing seven polymeric layers, comprising:

(a) two outer layers, at least one of which having a cling performance of at least 100 grams/inch, said outer layer being selected from the group consisting of linear low density polyethylene, very low density polyethylene, and ultra low density polyethylene resins, said resins being homopolymers, copolymers, or terpolymers, of ethylene and alpha-olefins; and

10 (b) five inner layers, with each layer being selected from the group consisting of linear low density polyethylene, very low density polyethylene, ultra low density polyethylene, and metallocene-catalyzed linear low density polyethylene resins, said resins being homopolymers, copolymers, or terpolymers, of ethylene and alpha-olefins.

15 2. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein said alpha olefins are propylene, 1-butene, 1-pentene, 1-hexene, 4-methyl-1-pentene, or 1-octene and range from C<sub>3</sub> to C<sub>20</sub>.

20 3. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein no cling additives are present in said stretch wrap film.

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4. The multi-layer, thermoplastic stretch wrap film of claim 2,  
wherein said alpha-olefins range from C<sub>3</sub> to C<sub>8</sub>.

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5. The multi-layer, thermoplastic stretch wrap film of claim 1,  
wherein said copolymers has an alpha-olefin weight percentage of 4 to 15% by  
weight.

6. The multi-layer, thermoplastic stretch wrap film of claim 1,  
wherein, wherein the resin melt index for each outer layer is 0.2 to 10 dg/min.

7. The multi-layer, thermoplastic stretch wrap film of claim 1,  
wherein, wherein the resin melt index for each inner layer is 0.5 to 10 dg/min.

8. The multi-layer, thermoplastic stretch wrap film of claim 1,  
wherein the resin density for each layer is about 0.860 to 0.940.

9. The multi-layer, thermoplastic stretch wrap film of claim 1,  
wherein the hexane extractable level is below 3.5 weight percent.

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10. The multi-layer, thermoplastic stretch wrap film of claim 1,  
wherein the outer layers are 5 to 7 weight percent of the total film weight.

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11. The multi-layer, thermoplastic stretch wrap film of claim 1,  
wherein at least one said inner layer comprises low density polyethylene  
homopolymers, wherein said low density polyethylene homopolymers have a  
5 melt index of between about 0.2 to 10 dg/min; and a resin density of between  
about 0.86 to 0.94 g/cc.

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12. The multi-layer, thermoplastic stretch wrap film of claim 1, which  
further comprises one outer layer with substantially no inherent cling  
10 characteristics.

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13. The multi-layer, thermoplastic stretch wrap film of claim 1,  
wherein the cling force at 0% elongation is about 100 grams to 300 grams as  
measured according to ASTM D5458.

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14. The multi-layer, thermoplastic stretch wrap film of claim 1,  
wherein the transverse directional tear resistance is at least about 400 to 700  
g/mil as determined by ASTM D1922 and a MD Elmendorf tear resistance of  
at least about 50 g/mil to 350 g/mil.

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15. The multi-layer, thermoplastic stretch wrap film of claim 1,  
wherein said outer layers have a thickness of 5 to 7% each of the total  
thickness of the film, and

said five inner layers have a thickness of 5 to 28% each of the total  
5 thickness of the film.

16. The multi-layer, thermoplastic stretch wrap film of claim 1,  
wherein said seven polymeric layers are represented by the following formula:  
A/C/B/C/D/C/E, wherein the relative composition of the layers is  
10/20/10/20/10/20/10, % thickness and/or parts by weight, respectively,  
with A and E representing a linear low density polyethylene hexene-copolymer,  
B and D representing a metallocene catalyzed linear low density polyethylene  
copolymer, and C represents a linear low density polyethylene hexene-  
copolymer.

17. The multi-layer, thermoplastic stretch wrap film of claim 16,  
wherein layers A and E have a melt index of 3.2 dg/min and a density of 0.917  
g/cc; layers B and D have a melt index of 2.5 dg/min and a density of 0.917  
g/cc; and layer C has a melt index of 2.0 dg/min and a density of 0.917 g/cc.

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18. The multi-layer, thermoplastic stretch wrap film of claim 1,

wherein said stretch wrap film has a MD tensile elongation (%) of 400 to 700, a TD tensile elongation (%) of 600 to 900, a MD Elmendorf tear (g/mil) of 200 to 400, a TD Elmendorf tear (g/mil) of 450 to 700, and a dart impact (g) of from 100 to 300.

19. The multi-layer, thermoplastic stretch wrap film of claim 1,

wherein said seven polymeric layers are represented by the following formula:

A/C/B/C/D/C/E, wherein

A represents :

a C<sub>2</sub>/C<sub>4</sub>/C<sub>6</sub> very low density polyethylene terpolymer with a melt index of 2.5 dg/min and a resin density of 0.910 g/cc, with a thickness of 2% of the total thickness of said stretch wrap film, or

a C<sub>2</sub>/C<sub>6</sub> linear low density polyethylene copolymer blended with a C<sub>2</sub>/C<sub>3</sub> copolymer to form a polymer with a melt index of 2.5 dg/min and a resin density of 0.915, with a thickness of 5% of the total thickness of the stretch wrap film;

B and D represent:

a C<sub>2</sub>/C<sub>6</sub> metallocene catalyzed copolymer resin with a melt index of 1 or

2.5 dg/mm and a resin density of 0.910 g/cc and a melt flow ratio of 16-20

g/10 min; wherein D and D have a thickness of 7 to 10% of the total thickness of the stretch wrap film;

C represents :

a C<sub>2</sub>/C<sub>6</sub> linear low density polyethylene copolymer with a melt index of 2 dg/mm and a resin density of 0.917 g/cc, or

a C<sub>2</sub>/C<sub>6</sub> linear low density polyethylene copolymer with a melt index of 2 dg/mm and a resin density of 0.917 g/cc blended with a low density polyethylene homopolymer with a melt index of 0.2 to 2 dg/mm at a ratio of 95:5 to 75:25; wherein C has a thickness of 60 to 81% of the total thickness of the stretch wrap film; and

E represents:

a C<sub>2</sub>/C<sub>4</sub> linear low density polyethylene copolymer with a melt index of 2 dg/mm, or

a C<sub>2</sub>/C<sub>6</sub> linear low density polyethylene copolymer with a melt index of 3 dg/mm and a resin density of 0.917 g/cc, wherein E has a thickness of 5 to 10% of the thickness of the stretch wrap film.

20. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein said seven polymeric layers are represented by the following formula:

A/C/B/C/D/C/E, wherein

A represents:

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a C<sub>2</sub>/C<sub>4</sub>/C<sub>6</sub> very low density polyethylene terpolymer with a melt index of 2.5 dg/min and a resin density of 0.910 g/cc, with a thickness of 2% of the total thickness of said stretch wrap film, or

5 a C<sub>2</sub>/C<sub>6</sub> linear low density polyethylene copolymer blended with a C<sub>2</sub>/C<sub>3</sub> copolymer to form a polymer with a melt index of 2.5 dg/min and a resin density of 0.915, with a thickness of 5% of the total thickness of the stretch wrap film;

B and D represent:

60 a C<sub>2</sub>/C<sub>6</sub> metallocene catalyzed copolymer resin with a melt index of 1 dg/mm and a resin density of 0.917 g/cc and a melt flow ratio of 16-20 g/10 min; wherein B and D have a thickness of 7 to 10% of the total thickness of the stretch wrap film;

C represents:

65 a blend of a C<sub>2</sub>/C<sub>6</sub> linear low density polyethylene copolymer with a melt index of 1 dg/mm and a low density polyethylene with a melt index of 2 dg/mm in a ratio of 95:5 to 75:25; wherein C has a thickness of 60 to 81% of the total thickness of the stretch wrap film; and

E represents:

20 a C<sub>2</sub>/C<sub>4</sub> linear low density polyethylene copolymer with a melt index of 2 dg/mm, or

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a C<sub>2</sub>/C<sub>6</sub> linear low density polyethylene copolymer with a melt index of 3 dg/mm and a resin density of 0.917 g/cc, wherein E has a thickness of 5 to 10% of the thickness of the stretch wrap film.

5 21. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein said seven polymeric layers are represented by the following formula: A/C/B/C/D/C/E, wherein

A and E represent:

10 a C<sub>2</sub>/C<sub>4</sub> linear low density polyethylene copolymer with a melt index of 2 dg/min and a resin density of 0.910 g/cc, with a thickness of 5 to 10% each of the total thickness of said stretch wrap film,

B and D represent:

15 a C<sub>2</sub>/C<sub>6</sub> linear low density polyethylene copolymer resin with a melt index of 2 dg/mm and a resin density of 0.910 g/cc, with a thickness of 7 to 10% of the total thickness of the stretch wrap film; and

C represents:

20 a blend of a C<sub>2</sub>/C<sub>4</sub> linear low density polyethylene copolymer with a melt index of 2 dg/mm and a density of 0.910 g/cc, with a thickness of 60 to 81% each of the total thickness.

22. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein at least one of said five inner layers comprise metallocene catalyzed



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polyethylene with a melt index of 0.5 to 5 dg/min and a melt flow ratio of 30 to 50 g/10 min, wherein said at least one of said five inner layers comprise 5 to 80 weight percent of the total film composition.

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23. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein the dart impact as measured by the F-50 dart drop test procedure is at least 75 to 200 g/mil.

10 24. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein the melt flow index is between 0.2 and 10.

15 25. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein at least one layer contains blends of at least two of said resins.

20 26. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein said seven polymeric layers are represented by the following formula: A/C/B/C/D/C/E, wherein the relative composition of the layers is 7/24/7/24/7/24/7, % thickness and/or parts by weight, respectively, with A and E representing a linear low density polyethylene hexene-copolymer, B and D representing a metallocene catalyzed linear low density polyethylene

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copolymer, and C represents a linear low density polyethylene hexene-  
copolymer.

27. The multi-layer, thermoplastic stretch wrap film of claim 1,  
5 wherein the resin density for each layer is about 0.880 to 0.930.

28. The multi-layer, thermoplastic stretch wrap film of claim 1,  
wherein the resin density for each layer is about 0.900 to 0.925.

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29. A multi-layer, thermoplastic stretch wrap film containing seven  
10 polymeric layers, comprising:

(a) two outer layers, at least one of which having a cling performance of  
at least 100 grams/inch, said outer layer being selected from the group  
consisting of linear low density polyethylene, very low density polyethylene, and  
15 ultra low density polyethylene resins, said resins being homopolymers,  
copolymers, or terpolymers, of ethylene and alpha-olefins; and

(b) five inner layers, with each layer being selected from the group  
consisting of linear low density polyethylene, very low density polyethylene,  
ultra low density polyethylene, and metallocene-catalyzed linear low density  
20 polyethylene resins, said resins being homopolymers, copolymers, or  
terpolymers, of ethylene and alpha-olefins,

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wherein at least one of said inner layers comprises a metallocene catalyzed linear low density polyethylene resin with a melt index of 0.5 to 3 dg/min and a melt index ratio of 16 to 80.

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